R·I·T

Title: Xactix XeF2 Etcher

Semiconductor & Microsystems
Fabrication Laboratory **Revision: A** **Rev Date: 03/23/2016**

Approved by:

_____ / / _____ / /
Process Engineer Equipment Engineer

1 SCOPE

The purpose of this document is to detail the use of the Xactix XeF2 Etcher. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

2 REFERENCE DOCUMENTS

- Appropriate Tool Manuals
- MSDS for XeF2

3 DEFINITIONS

Sublimate- to change from a solid to a gas or from a gas to a solid without becoming a liquid.

4 TOOLS AND MATERIALS

4.1 General Description

4.1.1 The Xactix XeF2 Etcher may be used for dry, isotropic, vapor-phase etching of silicon.

4.2 Etch Fixtures

4.2.1 Etch fixtures

5 SAFETY PRECAUTIONS

5.1 Personal Safety Hazards

5.1.1 The Xactix XeF2 Etcher uses XeF2 gas which when combined with water forms HF. All substrates to be etched must be dry. Any substrate coming from a wet chemical process must be hard baked for 5 minutes at 150°C to dehydrate before processing with XeF2.

5.2 Hazards to the Tool

5.2.1 Ensure all covers and panels are on and closed. The gas box door must remain closed so the preheater can keep the XeF2 warm enough to sublimate.

5.2.2 XeF2 pressure set points must be below 3.3Torr. Above 3.8Torr at 25°C XeF2 will not sublimate. Set points above the sublimation limit will make the recipe stall waiting to achieve an unreachable pressure.

5.2.3 Any recipe requiring Nitrogen flow must have a minimum pressure set point of 2Torr. Lower pressures can cause Valve 11 not to open and recipe will not run and hang up.

6 INSTRUCTIONS

6.1 Initial State Check

6.1.1 Card Swipe In on card swipe panel #1.

6.1.2 Ensure the N2 regulator on the rear left corner of the tool indicates between 10 and 20 psi on the gage.

6.1.3 Ensure the emergency stop buttons are pulled out on both the system and the power control box below the bench.

6.1.4 Under the bench verify the LINE POWER light on the Power Control Box is on.

6.1.5 On the Power Control Box verify the Control Power light is on.

6.1.6 Ensure compressed air is on set between 70 and 100 psi gage on the left rear corner of the tool.

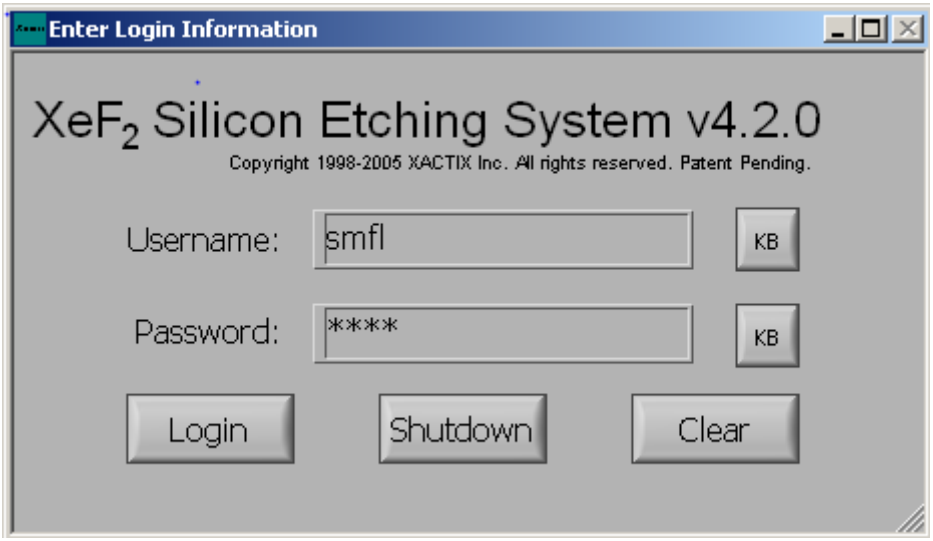
6.1.7 If the vacuum pump is not running or the system has been turned off, press the green START button on the front of the tool. This should start the e1 series Xactics as well as the vacuum pump. After start up allow up to 4 hours for the gas box to stabilize temperature before processing.

6.1.8 Ensure the Dell computer below the counter is on. If not start it.

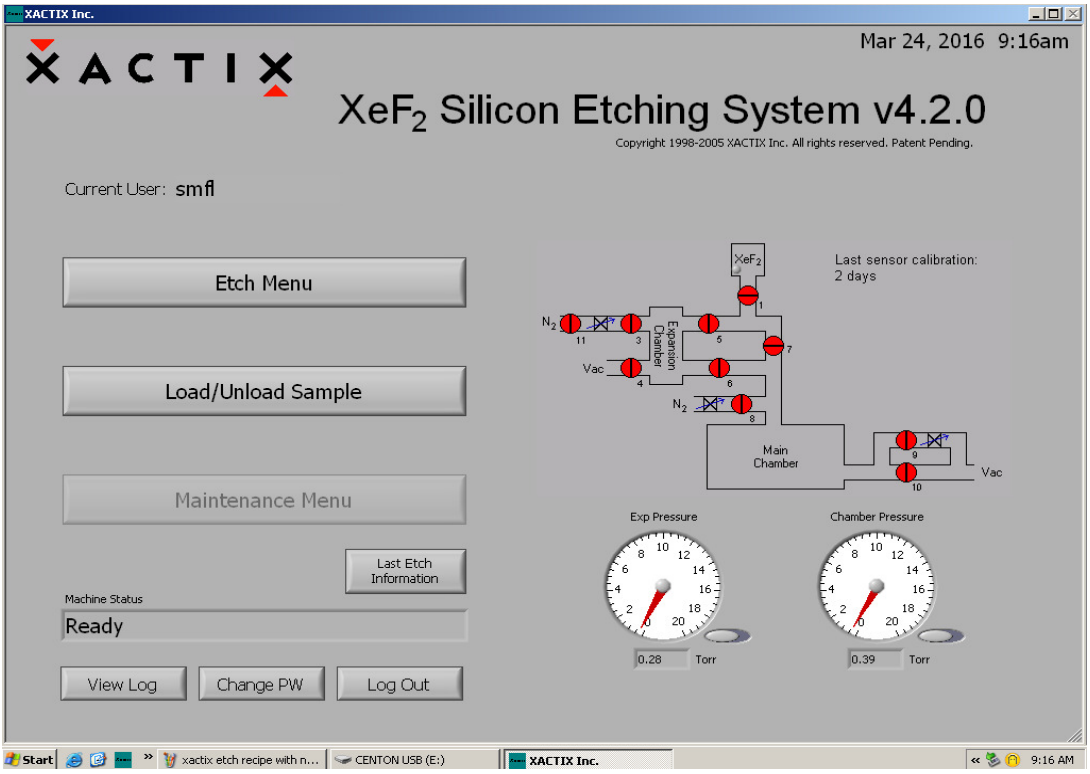
6.2 Starting the System

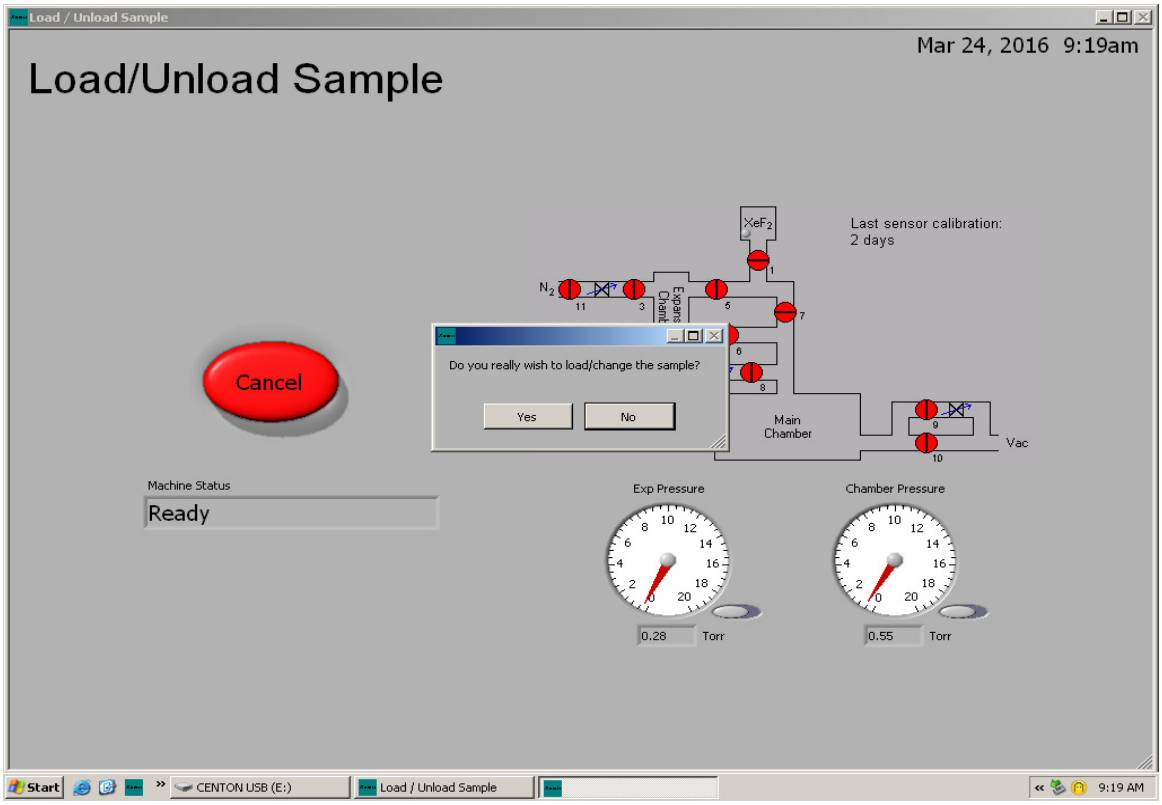
6.2.1 Launch the Xetch program from the desktop if not already open.

6.2.2 Login Username: smfl, Password: smfl all lower case and press Login.



6.2.3 From the main menu select Load/Unload Sample.





6.2.4 Answer "Yes" in the popup window and the system will pump and purge the chamber for approximately 3 minutes.

6.2.5 If a popup window appears "Please close the shroud now" pull the shroud handle forward to the mechanical stop until you hear it click. Then click "OK" in the popup.

6.2.6 "Load or unload the chamber now. Press Examine to temporarily pump down. Press Done to purge the chamber and return to the main menu." This should pop up telling you it's ready to load.

6.2.7 Lift the chamber lid open. The chuck is reversible for 4" or flip it over for 6". Place the chuck in the correct position for you sample. Load your sample. Close the lid and hold it down.

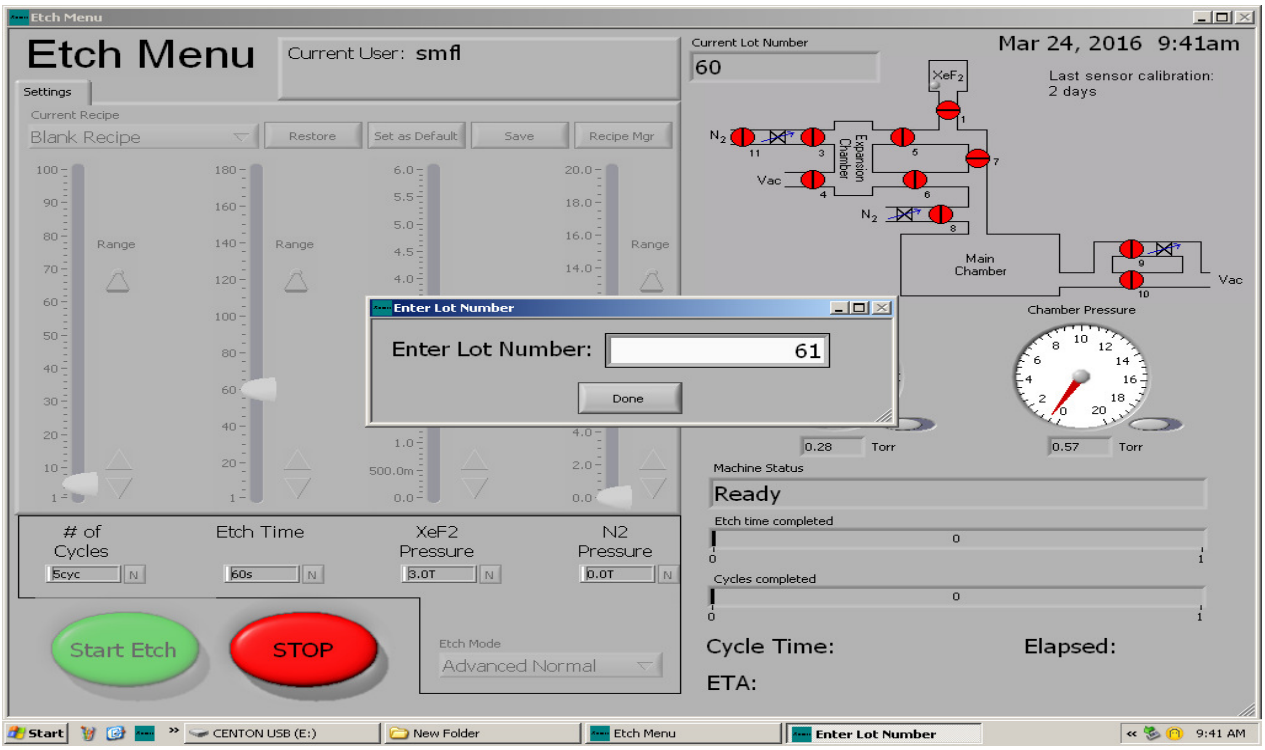
CAUTION: Don't press CANCEL during the loading sequence. If the 3 minute pump and purge doesn't finish, moisture from the air can form HF.

6.2.8 If the placement of the sample doesn't matter or if running whole wafers press Done and hold the lid down until the chamber is under vacuum. If the placement of your sample is critical, press Examine and hold the lid until the chamber is under vacuum. Examine the placement after applying vacuum. If the sample is fine press "OK" to return to the Load/Unload screen. Press Done and the chamber will start the 3 minute pump and purge. If the placement isn't good and need to be repositioned, press "OK" then open and

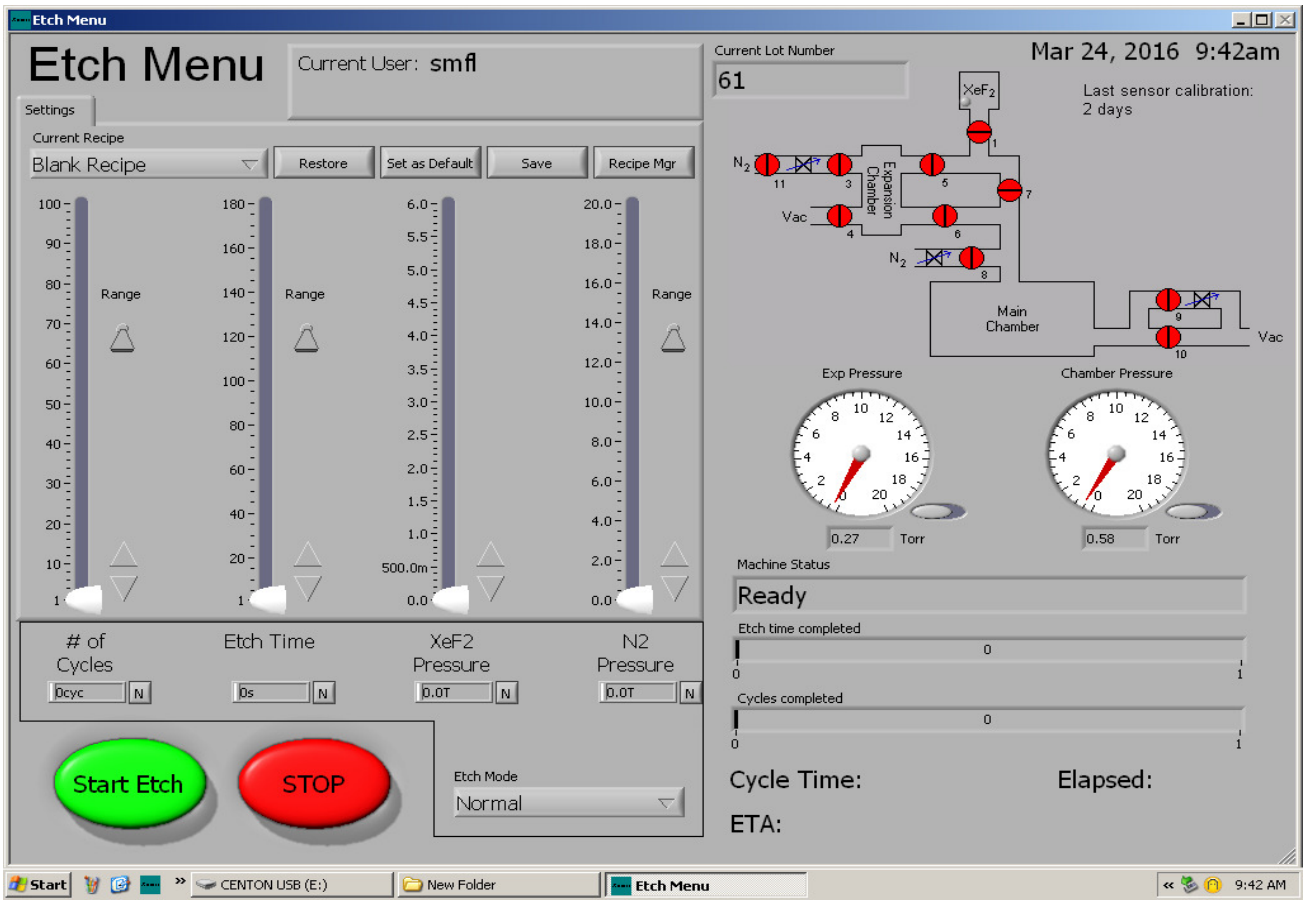
reposition the sample. Close the chamber and repeat the Examine pump down again until it is right.

6.3 Recipe

6.3.1 Once the 3 minute pump and purge is finished the screen will return to the Main Menu. Select Etch Menu. If needed enter the lot number. If not press Done.

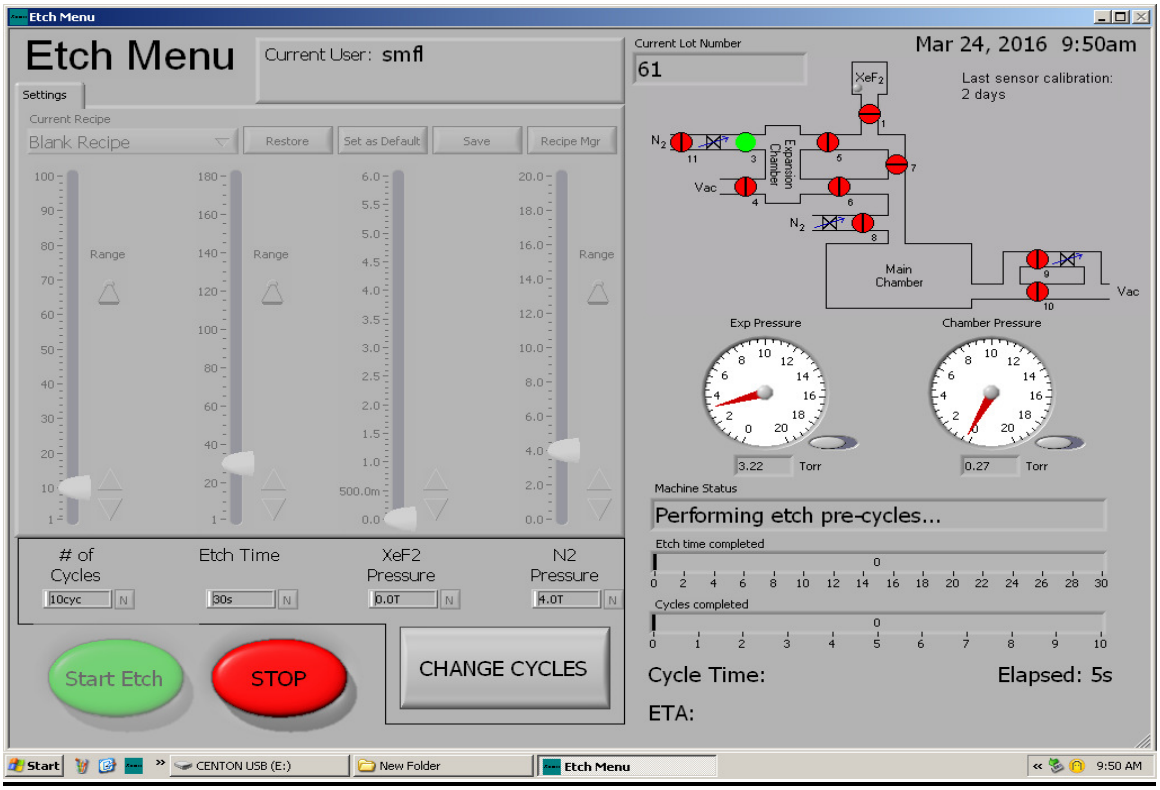


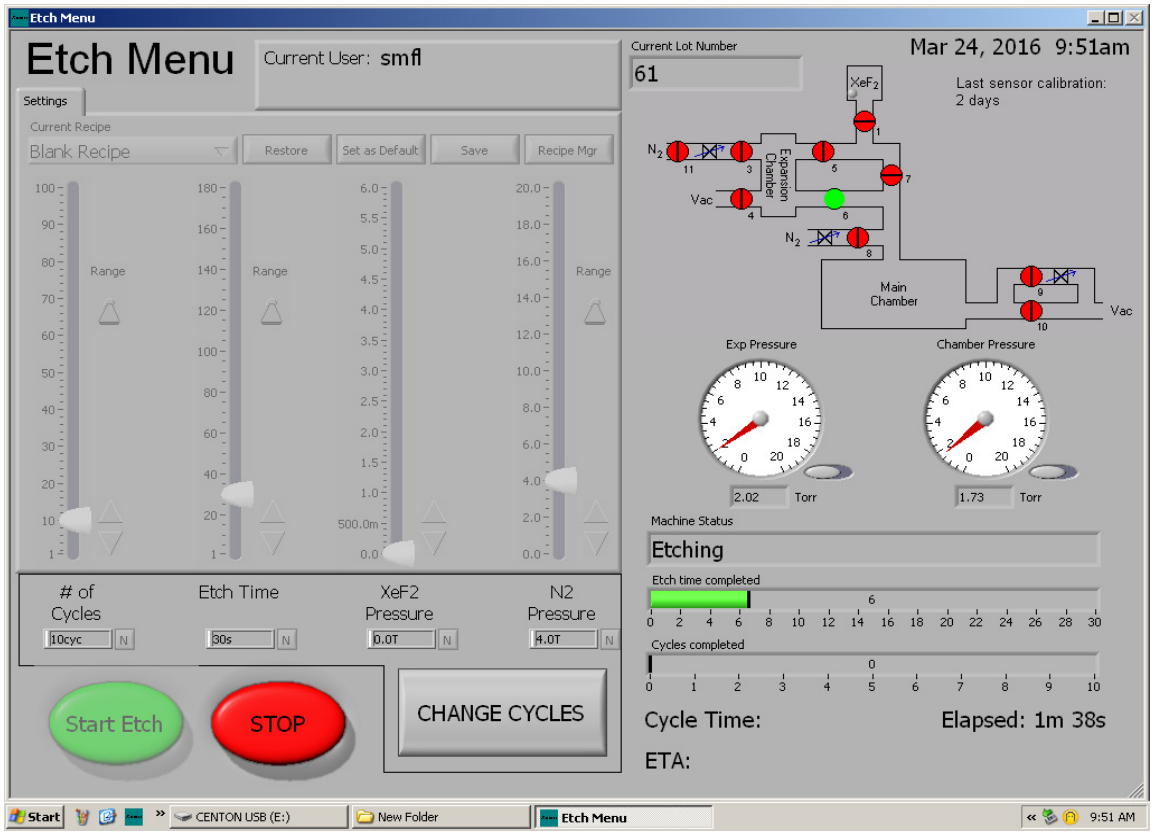
6.3.2 You can select and existing recipe. Most users create a recipe from the blank template. Move each slider to the desired value. Note the N2 must be set at zero or higher than 2.0 Torr or valve 11 may not open. XeF2 must be lower than 3.3Torr or the system will lock up trying to reach an unreachable pressure. Testing revealed the sublimation pressure at the machines stable temperature to be 3.3Torr for the XeF2.



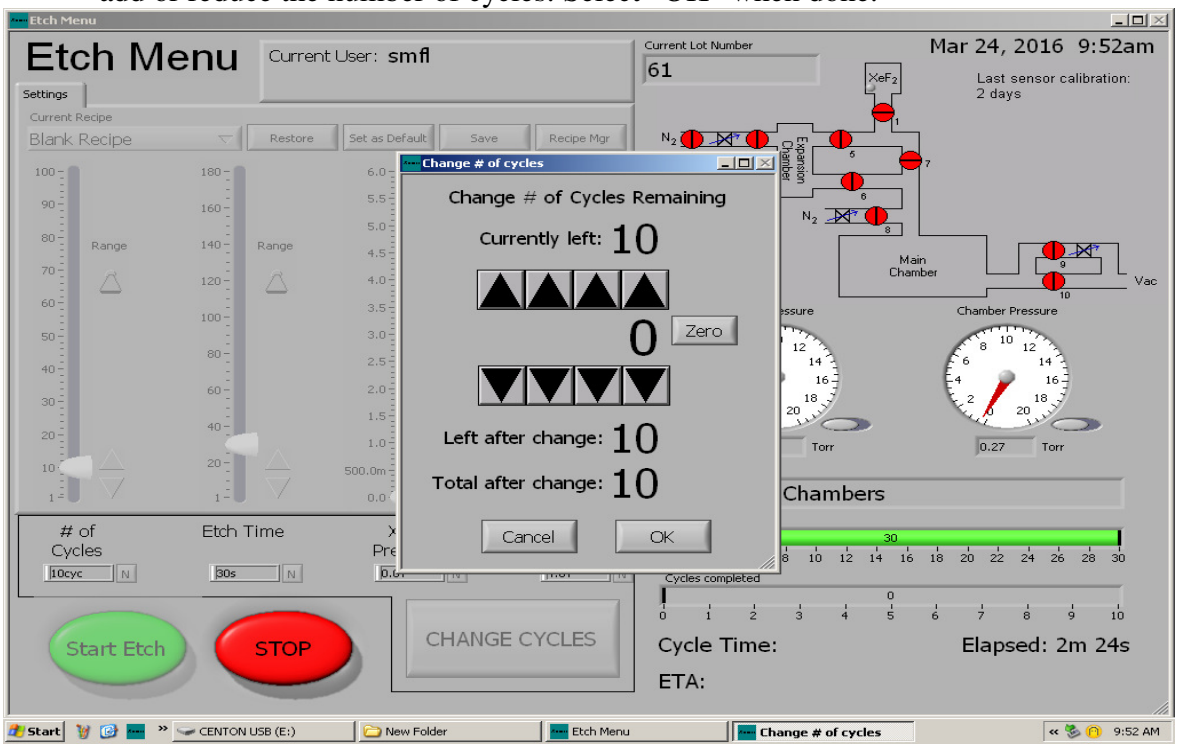
6.3.3 Either save the recipe or use it as a one-time etch. If saving the recipe click on Save. Type the name of the recipe and click Save again. Now the recipe is available in the Current Recipe drop down window.

6.3.4 Press Start Etch. The screen should display “Performing etch pre-cycles” This ensures it can reach all the recipe set points and the recipe will run properly. If all the set points are good, the screen will change to “Etching”.


Etch Menu
Etch Menu
Current User: smfl
Settings
Current Recipe
Blank Recipe
Restore
Set as Default
Save
Recipe Mgr
Range
# of Cycles
Etch Time
XeF2 Pressure
N2 Pressure
10cyc
30s
0.0T
4.0T
Start Etch
STOP
CHANGE CYCLES
Current Lot Number
61
Mar 24, 2016 9:50am
Last sensor calibration: 2 days
XeF2
N2
Vac
Expansion Chamber
Main Chamber
Exp Pressure
Chamber Pressure
3.22 Torr
0.27 Torr
Machine Status
Performing etch pre-cycles...
Etch time completed
Cycles completed
Cycle Time:
Elapsed: 5s
ETA:
Start
CENTON USB (E:)
New Folder
Etch Menu
9:50 AM


Etch Menu
Etch Menu
Current User: smfl
Settings
Current Recipe
Blank Recipe
Restore
Set as Default
Save
Recipe Mgr
Range
# of Cycles
Etch Time
XeF2 Pressure
N2 Pressure
10cyc
30s
0.0T
4.0T
Start Etch
STOP
CHANGE CYCLES
Current Lot Number
61
Mar 24, 2016 9:51am
Last sensor calibration: 2 days
XeF2
N2
Vac
Expansion Chamber
Main Chamber
Exp Pressure
Chamber Pressure
2.02 Torr
1.73 Torr
Machine Status
Etching
Etch time completed
Cycles completed
Cycle Time:
Elapsed: 1m 38s
ETA:
Start
CENTON USB (E:)
New Folder
Etch Menu
9:51 AM

6.3.5 During an etch recipe you can select “Change Cycles” to add or reduce the number of cycles. Select “OK” when done. During an etch recipe you can select “Change Cycles” to add or reduce the number of cycles. Select “OK” when done.



6.3.6 If you need to end a recipe early, you can click the “Stop” button once. The recipe will finish the current cycle and then switch to the Main Menu without any further input. If you double click the “Stop” button you can stop a recipe mid-cycle. A pop up window will appear and ask “Soft stop in progress-Do you wish to perform a hard stop?” Select “Yes, Hard Stop” and the cycle will immediately end and pump down the chamber and return to the Main Menu. If the cycle ends before you select Yes, Hard Stop or if the recipe ends it will pump down and return to the Main Menu anyway.

6.4 Inspection

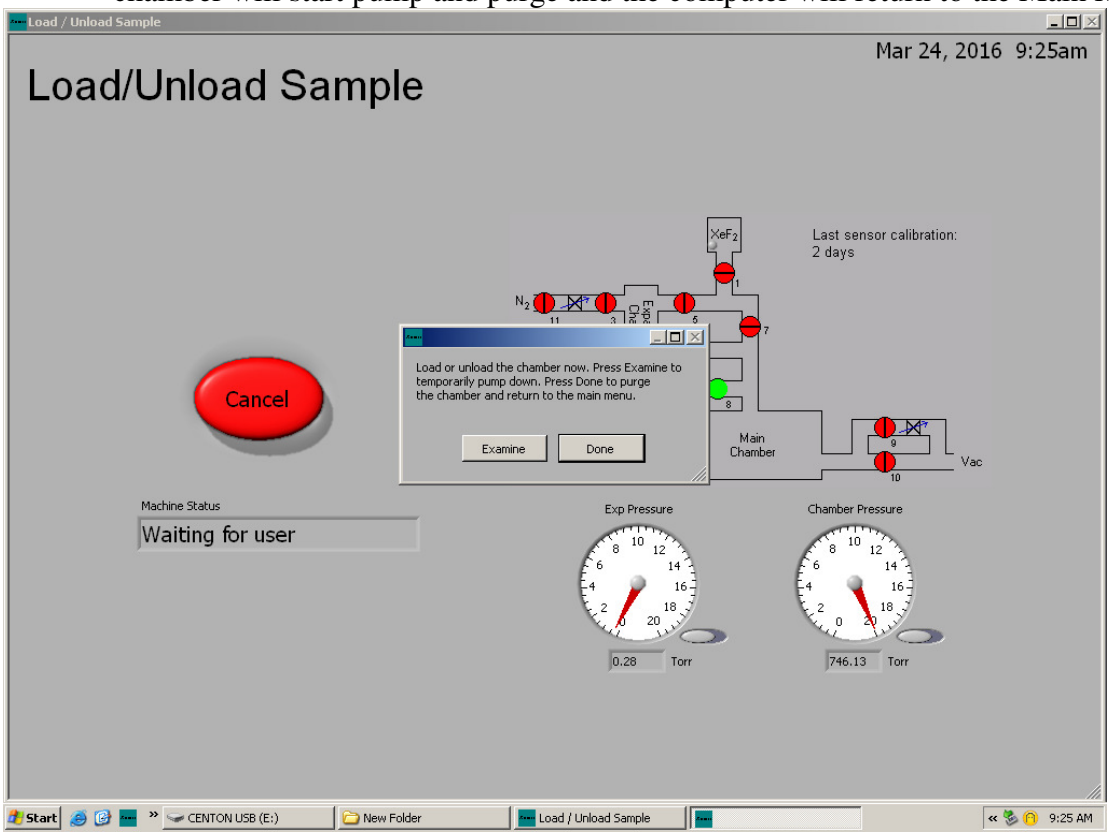
6.4.1 Unless in Load/Unload mode the shroud can be pushed back and the microscope can be positioned over the sample to inspect the etch process even while etching. Turn on the Schott light source at the right rear of the tool and focus on the sample.

6.4.2 Once inspection is completed move the microscope back, turn off the Schott light source and pull the shroud all the way forward again to the mechanical stop and click.

6.5 Load/Unload

6.5.1 Select "Load/Unload Sample" and repeat steps 6.2.3-6.2.6.

6.5.2 Unload the sample. Close and hold the chamber lid down and press "Done". The chamber will start pump and purge and the computer will return to the Main Menu.



6.6 Shut Down

6.6.1 Card Swipe out on card swipe #1.

6.7 Errors During a run

6.7.1 If the tool cannot reach base pressure and either stalls or gives and error. Call a technician. Either the calibration has drifted or the tool is leaking.

7 APPROPRIATE USES OF THE TOOL

If etching anything other than silicon contact the process engineer before proceeding. Though some other materials may work many other materials will not and could contaminate the tool. The tool is not intended to do gross removal of silicon. Clear all new processes with process engineering or staff.

REVISION RECORD

Summary of Changes	Originator	Rev/Date
Original Issue	**Bruce Tolleson**	A-03/23/2016